Environmental Impacts of Golf Course Design, Construction and Maintenance

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Goals:

- *Determine what the results of experiments concerning the fate of pesticides and fertilizers in different types of turfgrasses can tell about design, construction and management practices.*
- *Determine how to design buffer strips (natural areas) around lakes, streams and ponds.*
- *Evaluate approaches to golf course design and maintenance that can keep costs down while maintaining high environmental standards and aesthetic value.*

The purpose of this study was to synthesize current environmental research to develop a set of principles for more sustainable golf course design, construction, and management. These principles represent a synopsis of the current environmental research that has been published in a variety of journals (both refereed and non-refereed), books, and other sources.

In addition to the environmental benefits of the use of native vegetation in out-of-play areas, the research was extended to quantify the economic benefits of converting turfgrass areas to native vegetation. Prairie plants were selected for this analysis because their wide range of adaptation makes them practical for use on the widest array of golf courses. The goal of this economic analysis was to produce an estimated total cost of maintenance for golf course rough at each course. These values were then compared to the cost of establishment and management of the native vegetation on those areas to evaluate the time at which this type of turfgrass conversion could be expected to pay for itself.

The results of this study illustrate the maintenance savings available using native vegetation such as prairies. For all three of the courses studied, the conversion of turfgrass rough to prairie plants would pay for itself in reduced maintenance cost within the first two years, even using the highest priced prairie seed. In addition to making game more affordable, these areas would

provide tremendous opportunities for wildlife habitat and decreased chemical, fertilizer, and water usage. These will be important characteristics of future golf courses as maintenance costs and political pressures continue to rise.

It is hoped that the results of this study will demonstrate the environmental and economic benefits of turfgrass conversion and serve as an example of a more sustainable golf course design and management strategy. A sustainable golf course would be would be capable of generating its own energy, recycling its own waste, supporting wildlife, and performing all of these functions without detrimental impacts upon the environment. Many of the principles of sustainability can be used as guidelines for providing innovative solutions for growing environmental problems, and will be helpful shaping future golf course developments. Sustainable golf course developments will include holistic, ecologically based strategies to create courses that do not impair but instead repair and restore existing ecological systems such as plant and animal communities, soils, and hydrology.

One of the key criticisms identified in this research has been water and chemical usage on golf courses. Discussion of water and chemical usage involves evaluation of a very difficult question; how much water and chemical usage is acceptable? In an effort to approach sustainability, courses of the future will be looking to decrease water and chemical usage. The research demonstrated the economic benefits of the conversion of turfgrass to native vegetation. This solution also has significant environmental benefits through the creation of wildlife habitat and the elimination of water usage, chemical usage, and labor required to maintain these areas. It is likely that there will be a continual trend towards higher water and chemical costs and corresponding increases in costs for management of golf courses. Employment of the design, construction, and management principles discussed in this research will have a large impact upon how well courses will perform economically and in protection of the environment.

Golf courses of the future will also function as multiple users of the land in their effort to approach sustainability. For example, many opportunities that exist for the conversion of damaged lands such as landfills, industrial waste dumps, abandoned sand and gravel mines, rock quarries, and coal mines to golf courses. Development of golf courses on these degraded sites can create new habitat that supports many species of wildlife where before it was uninhabitable. The funds generated by golf courses make this conversion economically feasible. Courses also can be used to preserve urban open spaces and provide a flexible use for floodplain areas where other types of development should be avoided. Expanded use of native vegetation will provide wildlife habitat and increased biodiversity within the region and will provide educational opportunities for golfers and non-golfers alike. Effluent irrigation can be utilized on the courses, thereby creating another use for the land through waste treatment and water quality enhancement.

Continued research in the coming years will reveal more efficient irrigation systems and practices, better use of effluent for irrigation, new varieties of drought-resistant

turfgrasses, and other developments that will change how golf courses are built and maintained. It is likely that mounting environmental and economic pressures related to water quality and water usage will change the way golf courses do business in the future. So far, the golf industry as a whole has been quite receptive to these changes, as demonstrated by the commitment of the United States Golf Association to fund research related to water quality, turfgrass health, and improving golf course operations. Superintendents also continue to experiment with different management practices in an effort to decrease water and chemical usage and provide wildlife habitat on their courses. It is this kind of commitment to improvement that will keep the game of golf viable in the coming years as it faces rising costs of development and other environmental concerns.